Late Pliocene to early Pleistocene changes in the North Atlantic Current and suborbital-scale sea-surface temperature variability

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Résumé en anglais	The strength and latitudinal position of the North Atlantic Current, NAC, determines the position of the Arctic front and heat transport to the high northern latitudes with potentially important consequences for Northern Hemisphere glaciation. A southward shift in the NAC and reduced poleward heat transport is hypothesized to have triggered the last major climate transition in Earth's history - late Pliocene intensification of Northern Hemisphere glaciation (iNHG). In turn, iNHG is hypothesized to have led to the amplification of climate variability on suborbital time scales. To date, however, only a handful of adequately resolved records are available to test these two hypotheses. Here we present a new late Pliocene to earliest Pleistocene record from Integrated Ocean Drilling Program Site U1313 (North Atlantic, 41°N; 2.9 to 2.4 Ma). We use Mg/Ca-derived paleotemperature records in planktic foraminiferal calcite to investigate changes in summer sea-surface temperatures (SST) on orbital and suborbital time scales. Our results call into question the suggestion that significant weakening and/or southward shift of the NAC served as a trigger for Northern Hemisphere cooling and intensified continental ice sheet growth across iNHG. In contrast to the late Pleistocene, during iNHG, we find that the position of the NAC and Arctic Front probably lay well to the north of Site U1313 and that the amplitude of suborbital SST variability did not change on glacial-interglacial time scales. Conservative estimates of Late Pliocene to earliest Pleistocene interglacial summer SSTs in our record are up to 3°C warmer than present, while glacial summer SSTs are only 2°C to 3°C cooler. In fact, our interglacial summer SSTs are remarkably similar to those of the mid-Pliocene. Our findings indicate that iNHG must have involved amplifying feedback mechanisms that are tightly coupled to ice sheet growth but that these processes were insufficiently developed by the late Pliocene/earliest Pleistocene to have triggered large amplitude changes in suborbital climate in the midlatitude North Atlantic. Key PointsHigh SSTs argue against a significant weakening or southward movement of the NACSSTs show small-amplitude variability independent of glacial/interglacial stateiNHG involve amplifying feedback mechanisms tightly coupled to ice-sheet growth
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